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An Inaugural Essay

On

Miasmata

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On Miasmata

I have here, only made a nosegay of culled flowers & have brought nothing but the thread that ties them. An on-

My object in the present Essay is not to enter into a minute investigation of the subject of Miasmata, but merely to state the general opinions which regard to them & the facts & reasoning upon which they are founded. To attempt more, would indeed appear to me an idle & presumptuous undertaking. From experience, I can know nothing; & to indulge in unmeaning speculation is foreign to my habits.

Miasmata have been variously divided & arranged. I shall confine my attention to that species of miasm, which has been by the Italians called Malaria or bad air. To Lancisi has been awarded the merit of having first called the attention of the medical world

to this subject — To his writings indeed we are indebted for a great portion of the information we possess concerning their nature & origin —
Miasmata, in the sense I have indicated I shall define to be Animal exhalations from vegetables in a state of decay or putrefaction
Much I know has been said & written with respect to the power of putrid animal substances of eliminating pestilential effluvia: these opinions have however been so fully and ably refuted by Prof. Chapman in his "Thoughts on Epidemics" that it would be merely retracing his steps to attempt any thing further — Concerning the precise nature of miasmata, little or nothing is known — Various opinions have been offered on the subject; some of them plausible indeed; none of them clear or satisfactory — Here the resources of Chemistry, so inestimable on many occasions, have furnished us with no data, on which

to found a rational Explanation of the phenomena which they excite in the living system – According to Berthollet the air disengaged from marshy situations is hydrogen holding carbon in solution, containing something besides of the nature of an animal oil [a] – Varro as quoted by Lancisi supposed the noxious qualities to depend on the Existence of animalculæ in the Exhalations – "Thus Dr Langius (he observes) is a strenuous supporter of this opinion for he imagined that poisonous spirits or verminous atoms were exhaled from putrefying bodies & these inhaled by the breath or absorbed through the pores scattered their poison through the bowels [b] – The animalcular nature of malaria I have heard ingeniously & ably advocated by our distinguished Prof of Surgery, in his lectures; so far at least as regards Yellow fever It has also been supposed that those soils which

[a] Journal de Physique tom. XI [b] Mitchell's translation of Lancisi in N York Medical Record Vol 1st

have been termed miasmatic, produce disease by depriving the air of a portion of its oxygen: but this is satisfactorily shewn not to be the case from the fact of the Eudiometer shewing no difference whatever in the quantity of oxygen between these & the most salubrious situations — Moreover Gattani states that in repeated experiment, he found "the air of the putrid marshes of fort Twenty two degrees purer than the air at the summit of mount Legnone which is always covered with snow & is Elevated above the sea 8640 ft.[a] Yet although we know so little of their nature, the circumstances under which they are generated have been pretty clearly ascertained — To their formation Heat & Moisture are Essentially necessary, & the circumstances under which they are produced may be classed under four heads —

a Abbott on the Climates p 212 —

1° Stagnant pools or marshes - 2° the sites of these pools or marshes, the water having been dissipated by the action of the sun & a dry crust being left on the surface - 3 Newly cleared or ploughed grounds - 4° A soil composed principally of clay - In any of the above named situations a certain degree of heat is capable of producing that distemperature of the atmosphere, to which the appellation miasmatic, has been applied - The degree of heat is, not however definitively settled - Some contending, amongst whom, is Dr. Rush that a very high temperature, Even that of 96° is necessary - That this is true with regard to Yellow fever, there does not seem much room to doubt; but Experience has shewn, that the milder forms of fever, may be excited at much lower temperatures - This is the opinion of Prof. Chapman

the truth of which, he establishes, by the simple fact of putrefaction taking place at much lower temperature, than 86°. The violence and malignancy of the fever appear to depend very much if not entirely upon the degree of heat, as is exemplified in the fevers of tropical climates proving more fatal than those of cold or temperate situations. Yet though heat be essential to the formation of noxious exhalations, when excessive & uncombined with moisture, the putrefactive process is prevented from going on. This fact is observed in the interior of Africa, where camels having died in their journey through the deserts never putrefy, the moisture being so rapidly carried off by the heated atmosphere. The same thing is said by travellers to occur in the hotter & more sandy parts of South America. Heat

therefore it appears is of itself insufficient to produce those dreadful effects which have been attributed to it, unless when acting through the medium of a moist atmosphere.
But it has been justly remarked by Pringle[a] that "we must distinguish between moist & rainy seasons; for in marshy grounds intense continued heat, even without rain occasion the greatest mortality, by the exhalations which they cause & support in the atmosphere: whereas frequent showers during the hot season, cool the air, check the rise of the vapours, dilute & refresh the corrupted waters" I find stated that in Guinea, which has properly but two seasons, the wet & the dry; the rainy is the season of sickness: whereas for many months in the dry season most parts of the country are equally healthy & pleasant with any in the world,

a Pringle, p 4-5.

and even the woods and morasses are tolerably healthy - Again he adds. I am informed by a Surgeon who practised some time in Senegal, that for several months during the dry season, the country was as healthy, and as pleasant as any in the world; but soon after the raining season began, a low malignant fever appeared and which constantly spread itself amongst the Europeans[a] Directly the reverse of this according to Heustis happens at New Orleans - As in any season in New Orleans the season is always a healthy one, by keeping the ponds filled with water; whilst it has a contrary effect upon the country generally - This he attributes, to the circumstance of the ~~subsequent~~ decomposition of the subjacent matter being prevented by the body of water, which keeps it at a temperature below that necessary for a speedy decomposition - But in the latter instance

[a] Lind on hot climates, p. 58.

as soon as the water shall have in some degree dried up the Evolution of the miasm commences." It has been already remarked that "the sides of pools or marshes, the water having been dissipated by the action of the Sun & dry crust being left on the surface" are capable of Eliminating noxious Effluvia - This might at first sight appear to be in contradiction to the general proposition that moisture was Essentially necessary to their formation: but a short Examination will suffice to shew that it is in perfect accordance with what has been advanced - The soil though dry on the surface is moist beneath & upon Examination this crust will not be found to extend further than a few inches below the surface, where the soil will be found to consist principally of decaying vegetable materials, the Exhalations from which find a ready outlet through innumerable

a Hewitt on Diseases of Southern States, p 22

cracks in the crust above, and as might reasonably be expected in a highly concentrated form - The escape of these gases is much facilitated by the very circumstances, that prevent their escape in those situations where water already exists - I allude to frequent showers; which by softening the ground permit their escape in larger quantities - Pringle, speaking of the diseases of Flanders, says, "rain falling in a dry season when the ground has been parched up by intense heat, so far from refreshing & purifying the air, loads it with the most pestiferous miasmata" - From what has been said it will easily be understood, how newly cleared or ploughed grounds, produce fevers - In the first case where lands have been newly cleared, vegetable matter as plants leaves, roots &c ~~in a state of decay~~ which had previously been protected by trees from the influence of the

Sun, being exposed to the immediate action of its rays, putrefaction & consequently the elimination of unwholesome exhalations takes place. In the second instance, the decomposition, which has been going on subterraneously, is prevented from displaying its Effects; but as soon as an outlet is afforded by (ploughing or digging), to the Effluvia generated & the exposed earth being subsequently left to be acted on by the solar influence the same consequences result, as already described. I have mentioned another situation favorable to the production of this poisonous gas, a soil composed principally of clay. This fact was first pointed out by Linnæus, who goes so far as to assert that it originated in all places where clay abounded & only in such places. He supposed that the particles of clay being dissolved in the water drank by the inhabitants of

a at which seems to me the most satisfactory is the one assigned by Johnson - That the vapours which are exhaled during the day & diffused through the atmosphere are met by the descending cool dews, by which they are condensed & descend with them[a] De Lisle says that the dew is so much dreaded at Rome, that at the close of the day, the inhabitants retire to their houses; but after the first precipitation of vapour takes place, the streets are more crowded than before. Of the bad & even fatal effects of night air in malarious situations numerous examples are related by Lind; from whom I extract the following. In a voyage to the coast of Guinea performed in the year 1766 by the Phoenix ship of war of 40 guns; the officers & ships company were perfectly healthy; till on their return home they touched at the Island of St Thomas - Here the captain unfortunately went on shore to spend

a Johnson on tropical climates Vol 1 p 209

a few days in a house belonging to the Portuguese gov-
ernor of the Island – This happened during the rainy
or sickly season – In the same house were lodged
the Captain's brother; the Surgeon, some midshipmen
& the Captain's servants – But in a few days after
their being on shore, the Captain's brother, Surgeon &
every one of the number of seven, who had slept in
that house were taken ill and all of them died,
except one, who returned to England, in a very bad
state of health – The ship lay at anchor there, twen-
ty seven days, during which time; three midship-
men, five men and a boy remained on shore,
for twelve nights, to guard the water casks, un-
der the pretence, that the Islanders would steal
them: all of whom were likewise taken ill, & only
two escaped with life – At that time, only those
who slept on shore were taken ill; no other
man of the ships company was seized with
any distemper, during the ship's stay there –

2 ind p 134

To this thousands of other examples might be added from various writers but this I presume will be sufficient, to place in a strong point of view, the dangers of night air in unhealthy climates, The Extrication & diffusion of marsh Effluvia are also very much influenced by the prevalence of particular winds - Lind says that the years 1756 & 66 were distinguished by the uncommon appearance of intermitting & remitting fevers in most parts of England the obvious cause of them was, the unusual frequency of unwholesome Easterly winds - He further adds "an East wind in England, is often accompanied with a fog, which it is said to bring with it from the sea: but the truth of the matter is, that this wind raises a copious vapour from water mud & all marshy or damp places" - Moreby[illegible] declares that an East wind is felt in England by invalids, in their very beds - With

[illegible] p 16 - Lind on tropical climates p 67

respect to the deleterious influences of the East winds, all writers agree - Forster says that in every country in the world the east wind is almost proverbially unhealthy - Casual changes to East produce headaches, & nervous complaints & a long continued wind from that quarter produces on the whole, one season [a] "the men according to Lind, in those ships which lie in the river of Canton, are subject to agues occasioned by the North West winds, in November, which blow in that season over the low swampy rice grounds" But though the winds Exercise such an influence in the elimination & subsequent dispersion of these Effluvia, "hurricanes are said to arrest for a time the course of a pestilential disease in Tropical climates" [b] This fact was noticed by Wenham who says; "I have several times noted Epidemic fevers greatly abate both as to number & violence after storms & heavy rains ——

[a] Forster on the Atmosphere p 152 [b] Calcaval on Yellow fever p 31

As to the distance to which the marsh poison may be carried authors are not agreed — It is not improbable that much may depend on the particular state of the atmosphere at the time. In the work to which I have just alluded (Forster on the Atmosphere) the following question is proposed — "Is it possible that there may be some quality in the air at particular times whereby it is fitter for the conveyance of infection, [illegible] [illegible]? That there is, I have no doubt, but what that particular state of the atmosphere consists in I am not prepared to say; yet I cannot help suspecting that it is in some way connected with moisture — What renders this idea probable, is, that intermittents & remittents prevail most extensively in Spring & Autumn, the seasons most remarkable for rains — Yet it cannot be denied that we have fevers & more prevailing epidemically too, in the

driest seasons: hence I think we may well admit that we know almost as little of it as of that constituent of the air which is best fitted for the propagation of small pox, measles or influenza - Unless carried by the wind there is every reason to believe that the influence of marsh miasmata is very limited - which however must depend on the extent of surface from which they are exhaled - During calm weather they extend but a few and as probably from their source - They have proved harmless at the distance of two cables' length when water intervened - Bancroft mentions a quarter or half a mile as the greatest distance, to which they seem capable of being carried even under the most favorable circumstances - This notion is certainly unfounded - That they did not extend further in the instances he has quoted, is doubtless true,

but here water intervened & we are well aware of the power of this fluid of absorbing these Effluvia. Where they are not obliged to pass over water their sphere of action is much more extended. The Pontine marshes are several miles from Rome & yet when the wind blows from that quarter it frequently fills the town with pestiferous miasmata.

The Height to which marsh effluvia ascend has also been disputed. De Lisle says that Monte Mario which is adjoining to Rome & the one, in all the insalubrity of the neighbouring country is according to Boyslack 143 yards above the level of the sea. Tivoli which according to the same writer has an Elevation of 208 yards is infinitely more healthy. According to accurate measurement communicated by M. De Prony, Tivoli whose inhabitants seem to be out of the reach

of the bad air is 300 yards above the Pontine marshes - The villages of St Felice on the mountain of Circe on the other side of the marshes which is only 114 yards high & still lower down the environs of Terracina, which is 38 yards high are more & more exposed to the malignant influence of the miasmata that arise from them - It would seem therefore that the limit to which they extend is somewhere between 208 & 306 yards above the level of the places where the miasms arise: but this cannot be absolutely fixed as it varies year to year according to the heat, the wind that blows & the intensity & duration of black[a] This statement does not coincide with that of other writers of authority, who confine them within much narrower bounds - This seeming contrariety of sentiment may however I think be in some degree reconciled by observing that the calculations of Lind are derived from facts

[a] Lind on the climate &c

occurring in situations peculiarly adapted not only to the escape but to the dissemination of these unwholesome vapours — Much we know depends on the quantity & extent of the putrefying materials, & in portions more circumscribed than the Pontine marshes the effects would be proportionately diminished: hence we can readily conceive the truth of the statements made by army & navy surgeons of soldiers stationed in the third stories of houses remaining almost perfectly healthy, whilst those on the basement stories were seriously attacked — All agree that the more lofty the buildings are the better; for the tenants of the upper stories not only enjoy better health, but when taken ill have the disease in the mildest form[a]

In reviewing the history of miasmata one feature presents itself as remarkable — it is the ease with which they are intercepted — Their

[a] Rome [illegible]

escape is said to be prevented entirely by a thick scum forming on the surface of ponds or marshes. Even under circumstances the most favorable to their formation - Numerous instances of disease might be quoted from imprudently clearing off this covering - Persons, it is said, in the most exposed situations have entirely escaped their deleterious effects; from sleeping merely under the cover of canvass - The preservative power of trees against the invasion of this Enemy are well known - M. Caspard observes, that the marshes in the vicinity are less injurious to health in proportion as they are more completely shaded by trees from the action of the wind - The neighbouring inhabitants sustain from them no other inconvenience than that which results from the vicinity of a very moist atmosphere; but when the trees are cut down & the earth

exposed naked to the immediate action of the Solar rays, malignant fevers begin to rage amongst the surrounding inhabitants & destroy the greatest part of those who had been employed in clearing the land. Dr Chapman relates that many situations in the United States formerly sickly have been rendered healthy, by planting rows of trees between them & the miasmatic spots[a]. These facts shew that by proper precautions much may be effected in marshy districts towards obtaining protection from the baneful influence of their exhalations. Besides the rule of interposing a barrier of trees when practicable, cultivation of these malarious situations is proposed by Ferguson as a counter agent to their pernicious effects, by "exhausting the morbific principle by a constant succession of crops"[b].

a. Journal tome VIII p 375. b Ferguson on the Means Possessed for Chapman's Journal Vol VII no 13.

Other precautions all agree in personal are also recommended by authors. The principal of these are - Never to, ~~[illegible]~~ to enter the infected districts before sunrise or after sunset - Never to enter them with an empty stomach, on this account a small quantity of food should be previously taken - One is are recommended that small quantities of wine, liquors or ardent spirits should be substituted. In the propriety of this practice I cannot concur - It is not stimulation of the stomach that is required, but something to induce the exercise of its peculiar functions, whereby it is better able to resist the aggression of morbid agents - Besides the stimulation of these liquors is evanescent & after this has subsided the system is left more obnoxious to the causes of disease - Attention should also be paid to diet

and clothing – As a general rule it may be remarked that whatever has a tendency to weaken or derange the healthy actions of the animal economy, renders the system a more easy prey to morbid agents – Hence there is no practice which we are called upon more loudly to condemn, than that of some misguided individuals, who led away by their own passions have persuaded themselves, & would fain persuade others, that the best means of prevention, consist in the constant use of ardent spirits & that carried even to intoxication In this country particularly where ardent spirits are so plenty & so cheap, such a notion cannot fail of entailing the most fatal consequences & we are called upon by every feeling of humanity to discountenance the practice – As preventive it has also been recommended that the dwellings should be

so constructed, that there should be no windows or doors fronting the marshes & that the smoke from the fires should be permitted to diffuse itself through the house[a] Sir Gilbert Blane says that certain internal medicines such as bitters, aromatics & small quantities of vinous liquors, tend to preserve the body from its (most powerful) bad effects - Sir Gilbert also remarks that as fevers produced by marsh effluvia do not shew themselves for some days, it would be advisable to take some doses of Peruvian bark after clearing the bowels by a purgative An Emetic I should suppose would be the more appropriate remedy - The spices of the country (E. Indies) he also remarks have also been found powerful in fortifying the body against the influence of noxious air. This, one among many circumstances that go to prove the truth of the general proposition, that

[a] Lind p 145

wherever Providence inflicts an evil it is always accompanied by the remedy or the preventive—